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REMARKS

Claims 1 - 37 are pending in the present application. Claims 1, 3 - 12 and 14 - 21 have been amended and new claims 22 - 37 have been added.

Applicant notes with thanks and appreciation that claims 3 - 7 and 9 - 21 were found to have allowable subject matter.

Claims 1, 2 and 8 were rejected under 35 USC §102(e) as being anticipated by US Patent No. 5829664 (*Spinella*).

Spinella does not teach or suggest the method of independent claim 1. Claim 1 recites among other limitations that "additional heat is supplied to the joint prior to and/or during the welding operation, in excess of the frictional heat generated in the joint from the rotation of the welding means and of any other heat that may be supplied to the joint in any other manner by the welding means."

The examiner asserts that *Spinella* teaches "heat from the electrical resistance heating can be supplied during welding by using heating through the rotating welding tool or prior to welding by using an electrode that advances ahead of the tool." There is no teaching or suggestion in *Spinella* that "additional heat is supplied to the joint prior to and/or during the welding operation" and that the additional heat is "in excess of the frictional heat generated in the joint from the rotation of the welding means and [is in excess] of any other heat that may be supplied to the joint in any other manner by the welding means."

In *Spinella*, all the resistive heat is supplied by the welding means. Without the acting of the welding means no resistive heat at all can be generated as the welding means closes the electrical current path.

The two *Spinella* embodiments only differ from each other in that the current supply path to the welding head and especially to the pin of the welding probe in the first embodiment (Fig.1) is closed by a fix connection to the workpieces and in the second embodiment is closed by a movable device such as a wheel. Thus, the first embodiment is most useful on smaller workpieces where the cables can be kept short even with a fixed connection. On the other hand, when the workpieces get longer it is simpler to arrange the power supply movable together with the welding means as shown in the Figure 2.

That *Spinella* only teaches or suggests heat (or potential heat) supplied by the welding means is evident from passages throughout the specification. There is no teaching or suggestion that heat is transferred to the workpieces at any other point than at the pin of the welding means. For example:

The present invention solves the problem of slow travel speeds of stir welding processes (without decreasing the quality of the welds effected),

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by heating the metal of the workpieces immediately adjacent the rotating stir tool with electrical resistance occurring between the stir tool and workpieces. A conventional welding supply can be used to provide current flow between a stir pin of the rotatable tool and the workpiece. **Electrical current can flow directly through the tool, pin and workpiece . . .** [*Spinella* at Column 1, lines 32-39 (emphasis added)].

Electrical current is **supplied to a stir pin 10 of a rotating tool 12 to provide heat via electrical resistance between the pin and abutting edges of two workpieces 14.** The heat of electrical resistance is thus supplied directly to a stir welding process, in addition to the heat generated by the mechanical friction occurring between the tool/pin and the abutting edges of the two workpieces 14 in forming weld seam 16 between the two workpieces. [*Spinella* at Column 1, line 66 to column 2 line 7 (emphasis added)].

The properties of the **remaining portions of the workpieces can be maintained by keeping bulk temperatures relatively cool.** These objectives are particularly important in welding aluminum alloy workpieces.

Stir welding can particularly provide a quality seam weld since **the heat generated to effect the weld is substantially confined to those portions (edges) of the workpieces actually being melted and welded.**" [*Spinella* at Column 2, lines 38-45 (emphasis added)].

The **heat affected zone of the abutting workpieces is limited essentially to the area of the workpieces located beneath rotating tool 12.** . . . [*Spinella* at Column 2, lines 64-66 (emphasis added)].

The amount of electrical current flowing to and through the tool and workpieces.

In this latter regard, the flow of electrical current can be **further confined to pin 10 by using an electrically insulating, heat resistant layer (washer) of material 25** located on the flat working end of tool 12. This directs current flow to pin 10 and the edge material of abutting workpieces 14. **This limits, in turn, the location and generation of electrically resistive heat to the pin and workpiece edges, which is where welding heat is needed and used. The bulk remainder of the workpiece material remains relatively cool.** [*Spinella* at Column 3, lines 2-12 (emphasis added)].

Again, **current flow is limited to the vicinity of pin 10 and the abutting edges of workpieces 14** if insulating washer 25 is used on the working end of tool 12. [*Spinella* at Column 3, lines 40-42 (emphasis added)]

The claims of *Spinella* further demonstrate that any heat is only generated at the pin of the welding means and only during welding.

Claims 1 to 3 all have the technical feature "using electrical resistance occurring between the workpieces and pin to provide additional heat to the workpiece edges for welding the two workpieces together" in common. Claims 4 to 8 all have in common the

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technical feature "means for applying electrical current serially to the pin and edges of said workpieces." Claim 7 explains the role of the wheel is to apply current to the pin and the workpiece edges where the pin engages the workpieces.

The above citations demonstrate that there is no intention in *Spinella* to supply heat at the location of the wheel. The heat is needed at the pin and it is undesirable to heat the workpiece elsewhere. In the light of the teachings of *Spinella*, Applicant respectfully asserts that Column 3, lines 15-18 of *Spinella*:

In a second embodiment of the invention (FIG. 2), electrically resistive heat is supplied by an electrode 30 engaging the workpieces 14 either before of the stir tool 12 (as shown) or after the tool (not shown).

should be interpreted in such a way that the electrode 30 is necessary to supply the heat because it closes the current path, which is essential to get extra heat at the pin location. Thus, *Spinella* does not teach or suggest a method of friction stir welding with all the limitations of claim 1. Claim 2 depends from claim 1, this claim 2 is also patentable for the reasons discussed above.

Further, the area of electrical connection at the welding means is limited by insulating washer, which confines the location and increases the resistance (as the area decreases). In *Spinella* nothing at all is taught or suggested about the size or the shape of the electrode 30 for the purpose of limiting the electrical conductivity and thereby causing resistive heating at the location of the electrode. The only thing taught regarding the electrode is that it should be electrically conductive. This is necessary for closing the current path. Additionally, one skilled in art would recognize that because of this the resistance is intended to be low.

Independent claim 8 is an apparatus for friction stir welding. Claim 8 recites among other limitations that the apparatus has a "heating element for supply of additional heat to the joint prior to and/or during the welding operation, in excess of the frictional heat generated in the joint from the rotation of the welding means and of any other heat that may be supplied to the joint in any other manner by the welding means." For the reasons discussed above with respect to claim 1, *Spinella* does not teach or suggest a friction stir welder with all the limitations of claim 8. Thus, claim 8 is patentable.

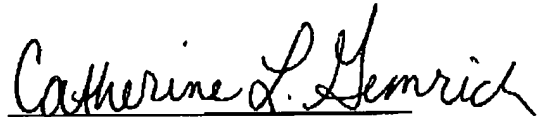
In *Spinella*, all the heat is supplied by the welding means. Because the additional heat according to *Spinella* cannot be supplied prior to the welding operation as the electrical path at that time is not closed, new independent claims 22 and 23 are patentable. Further, these claims are patentable for all the reasons discussed above.

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CONCLUSION

Having obviated the Examiner's objections, Applicant hereby seeks an early
Indication of allowance.

Respectfully submitted,

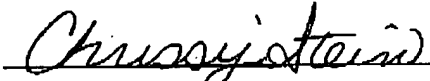


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CERTIFICATE TRANSMISSION

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